Rehabilitated and Treatment Wetland Solutions for the Peconic River

Presentation to

Department of Energy-Brookhaven Peconic River Team

By

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WESTON Attendees

Jim Nuccio,Client Services Manager, Brookhaven National Laboratories

Roger W. Lehman, P.E., Technical Manager, Constructed Wetlands Design

John D. Pauling, P.E., Program Manager, Ports and Waterways

CLEMSON Team Members

John H. Rodgers, Jr., Ph.D., Chair,
Department of Environmental Toxicology

D. Lamar Robinette, Ph.D., Professor,
Department of Forest Resources

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Proposed Agenda

WESTON and CLEMSON Overview

WESTON and CLEMSON Wetlands Experience relevant to the Peconic River challenges

Conclusions

WESTON Overview

- Leading Environmental Infrastructure Redevelopment Company
- Leader in the development and implementation of innovative techniques for problem solving.
- Full service capabilities with a strong presence in the northeast.
- Over 2,000 Employees in 60 Offices Worldwide

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Clemson University Overview

- The Clemson Institute of Environmental Toxicology is involved in research, teaching and service. Currently the Institute has 12 professors and 38 graduate students.
- Research activities encompass the areas of aquatic ecotoxicology, terrestrial ecotoxicology, ecological modeling, biochemical and molecular toxicology, immunobiology, antimicrobial resistance, analytical chemistry.
- Located in a dedicated, 38,000 sf modern building with state-of-the-art research laboratories.

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Wetland Ecosystems

- **Rehabilitated/Restored – attempting to undo or compensate for man's activities.**
  - **Reduce or remove impacts to wetland systems.**
  - **Purpose of the design is to provide nature with a "jump start" to restoring the natural ecosystem.**
- **Treatment – utilizing the unique chemical and thermodynamic processes that exist in wetlands to perform an environmental quality improvement.**

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Wetland/Floodplain Rehabilitation Case Study

Sediment Removal and Ecosystem Rehabilitation of Portage Creek, Kalamazoo Superfund Site, Kalamazoo Michigan (USACE Rapid Response)

- WESTON was contracted to remove 145,000 cy of PCB contaminated sediments from a 1.2 mile stretch of the Portage Creek main channel and floodplain.
- Following the sediment removal, WESTON was tasked with rehabilitating the area to restore the natural ecosystem.

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Rehabilitation Plan

- **Design objectives**
  - **Reestablish stream alignment including meanders.**
  - **Rapid revegetation.**
  - **Local and native plant species.**
  - **Stream bank stabilization relied on on-site materials including tree trunks and boulders.**
  - **Maintain floodplain at existing elevations.**
  - **Design and controls to minimize impacts to adjacent wetlands and aquatic systems.**

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Rehabilitation Plan (cont.)

- Key design features
  - Using logs and stump root wads to create in-stream to create fish and insect habitat.
  - Using residual logs and stumps to create brush piles for wildlife habitat.
  - Creating areas of new wetlands using plants from an on-site source.
  - Creating 10 schrub planting areas to provide wildlife habitat.
  - Stream diversion to create a “dry” work area for sediment removal.

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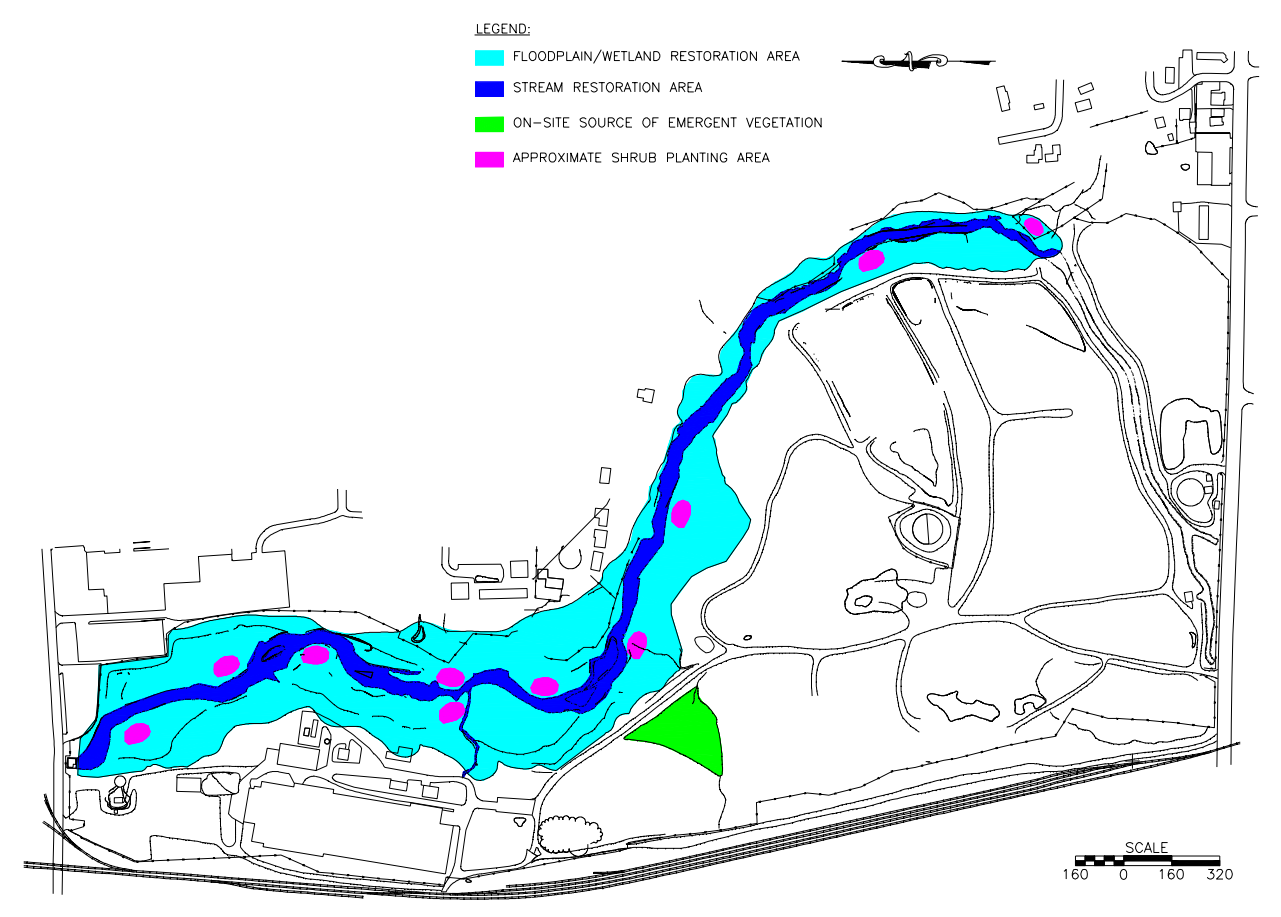
Rehabilitation Plan (cont.)



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Implementation (cont.)

Existing conditions after clearing of trees.

Implementation (cont.)

Placement of rock for stream channel stabilization.

Implementation (cont.)

Aerial photo shortly after completion of construction.

Implementation (cont.)

Rehabilitation area approximately 6 mo. later.

Treatment Wetlands

- Clearly defined objectives and an integrated design approach that combines wetland "macrofeatures" (hydrosoil, hydroperiod, hydrophytes) such that the transfers and transformations on materials are thermodynamically possible and likely.
- Integrated design approach utilizes theoretical (mathematical) modeling to create a physical (bench or pilot scale) model.

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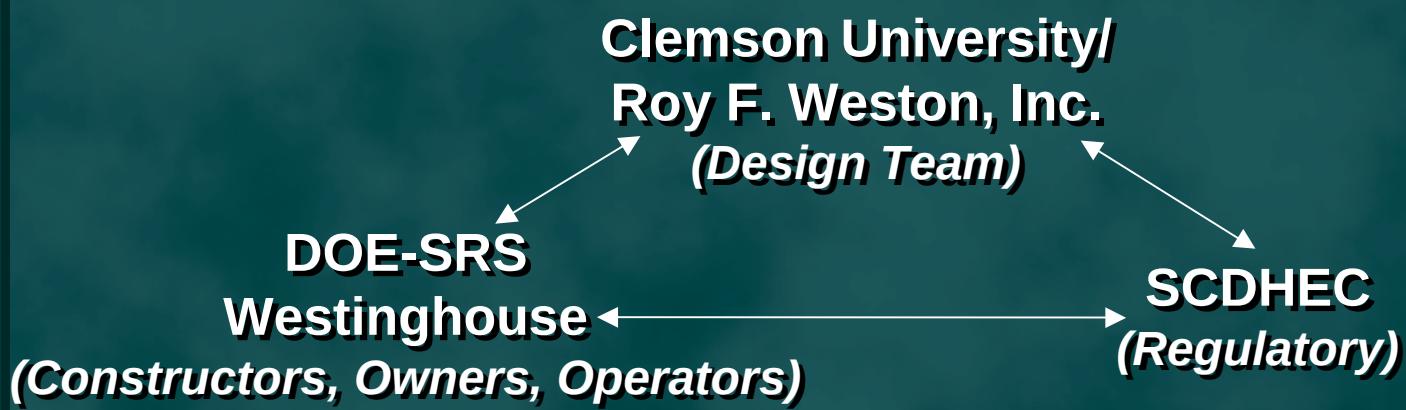
Treatment Wetland Case Study

Savannah River Site A-01 Outfall

Contains constituents (i.e., copper, lead, zinc, mercury) that occasionally exceed discharge permit limits and cause toxicity in aquatic test animals.

Partnerships



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Treatment Design

- **Project objectives**
  - **Treat 0.97 MGD normal process flow commingled with storm water runoff for targeted constituents to meet NPDES limits.**
  - **Manage and treat the 25-yr recurrence interval storm event.**
  - **Scale modeling provided key insights that optimized the design and refined key enhancements to create a rapidly starting system.**

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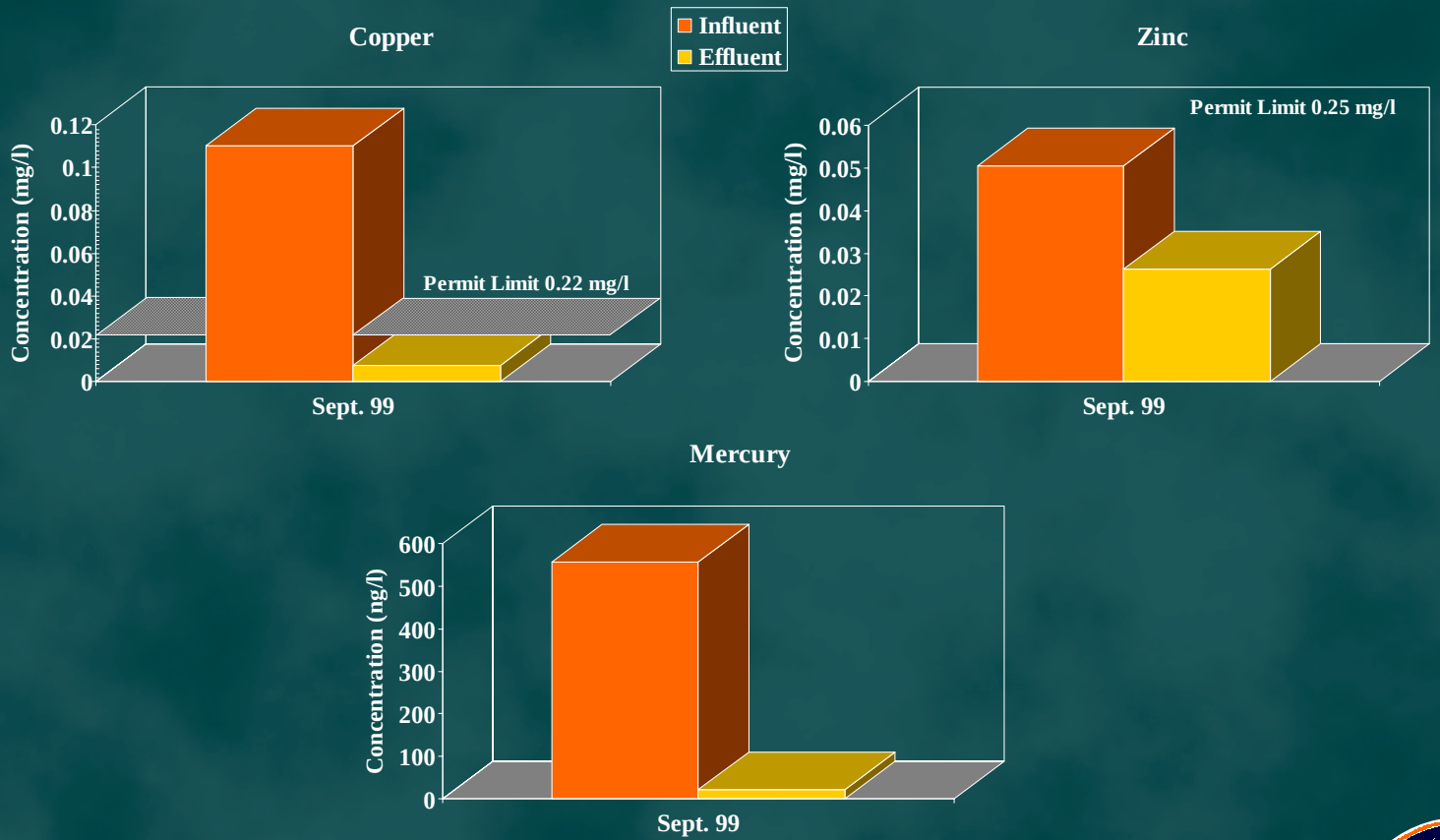
Scale Modeling

Clemson bench scale confirmation study.

On-site pilot scale confirmation study.

(Dr. Rodgers received the Savannah River Technology Center's Vice President's Award for his work on the confirmation model study.)

Scale Modeling Results



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Key Design Features

- 21 million gallon flow management basin for regulating flows to the constructed wetlands.
- Eight 1-acre free water surface cells arrayed in pairs using scirpus californicus (giant bulrush)
- Geosynthetic clay liner for the cells and normal pool area of the flow management basin.
- Simple gravity design that needed only 2 gate valves. Solar powered sampler eliminated any power needs.

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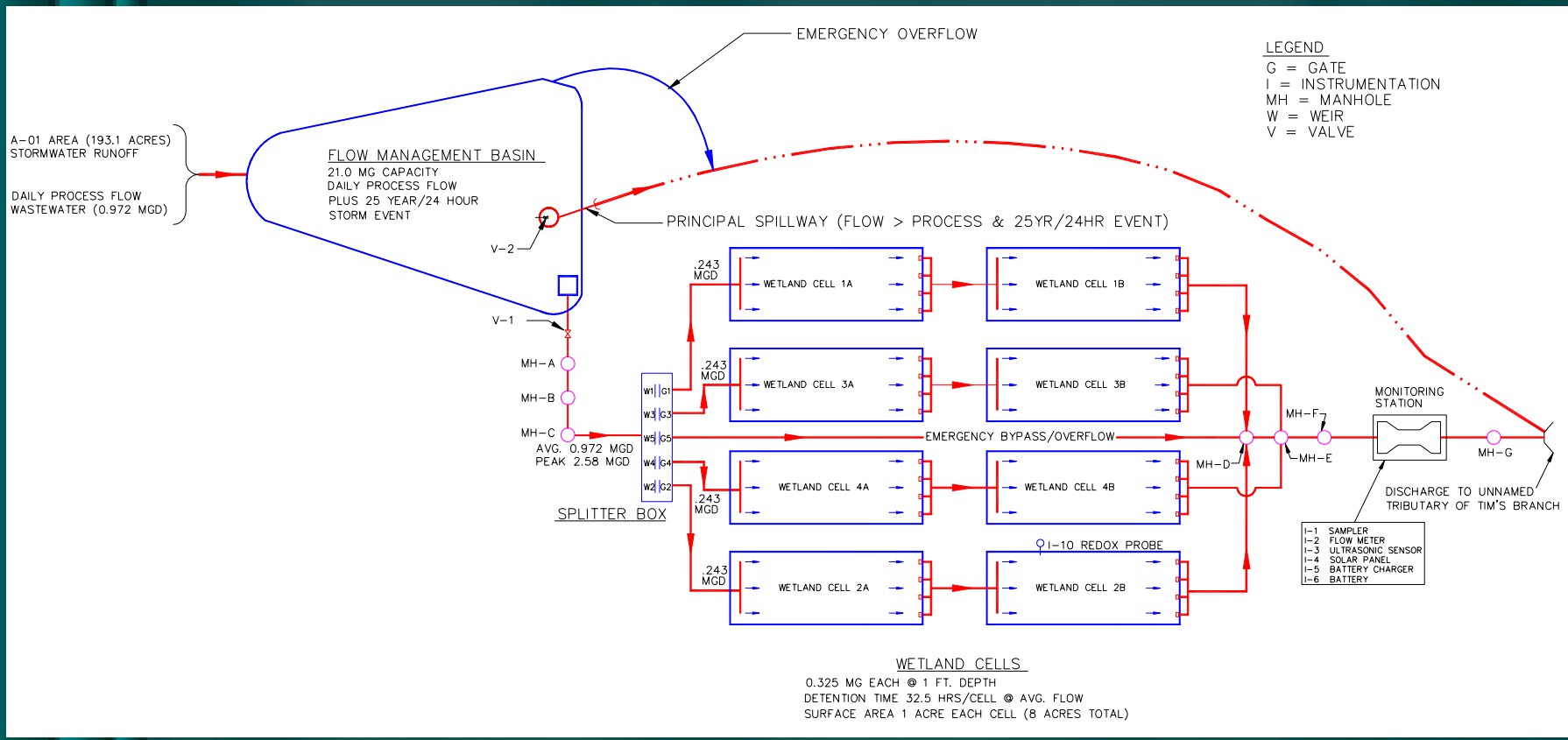
Key Design Features (cont.)



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Implementation

Existing conditions after clearing of trees and beginning of excavation.

Implementation (cont.)

Simple weir-type splitter box to divide flow evenly to each of the four pairs of cells.

Excavation and final grading of the wetland cells.

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Implementation (cont.)

Drs. Robinette and Rodgers lending a hand.

Graduate students planting the cells.

Implementation (cont.)

Aerial photo of completed cells.

Implementation (cont.)

GCL liner being placed in the normal pool area of the flow management basin.

Flow management basin nearing completion.

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Conclusions

- **Rehabilitation and treatment wetlands are viable, cost-effective solutions to addressing the challenges faced in the restoration of the Peconic River.**
- **WESTON and Clemson provide a unique team that combines cutting edge science and research experience with solid engineering, construction, and project management experience.**

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